# Teaching Guidelines for

C++ Programming

# PG-DAC September 2023

**Duration: 72 hours** (32 theory hours + 32 lab hours + 8 revision/practice hours )

**Objective:** To learn object oriented programming using C++

**Prerequisites:** Knowledge of computer fundamentals

**Evaluation:** 100 marks

**Weightage:** CCEE – 40%, Lab exam – 40%, Internals – 20%

## Text Book:

* C++ Primer Plus by Stephen Prata /Pearson

## References:

* Thinking in C++ by Bruce Eckel
* The C++ Programming Language, Bjarne Stroustrup

(Note: Each Session is of 2 hours)

## Sessions 1: Getting Started Lecture:

* Installation and Setup development environment
* The need of C++
* Features of C++
* C++ versus C
* History of C++
* Writing your first C++ program

## Lab:

Write different C++ programs to

* Print Hello World
* Add two numbers/binary numbers/characters
* Calculate compound interest
* Calculate power of a number
* Swap two numbers
* Calculate area of rectangle

## Session 2: Beginning with C++ Lecture:

* C++Program structure
* Introduction of advanced C++ concepts and feature of C++ 17
* C++ Tokens
* Initialization
* Static Members
* Constant Members
* Expressions Operators
* Arithmetic Operator
* Relational Operator
* Logical Operator
* Unary Operator
* Ternary Operator
* Assignment Operator

## Lab:

* Write a Student class and use it in your program. Store the data of 10 students and display the sorted data according to their roll numbers, dates of birth, and total marks.
* Implement all C++ operators
* Declare members and implement in your programs.

## Session 3: Conditional and Looping Statements Lecture:

* If, else if, switch
* for loop
* while loop
* do while loop
* Jump statement (break, continue& return keyword)
* Arrays
* Declaration and initialization of an array
* 1-D and 2-D arrays

## Lab:

* Implement all control structures through your program
* Implement a program which accepts command line arguments from main function.

## Session 4: Functions in C++ Lecture

* Different forms of functions
* Function prototyping
* Call by Reference
* Inline Functions
* Math library functions etc.

## Lab:

* Implement functions through your program
* Declare function and call it by reference and note the observations
* Implement Inline functions in your program

## Sessions 5 & 6: Memory Management and Pointers Lecture

* Introduction to memory management in C++
* Pointers in C++
* Arrays using pointers
* Enumeration
* Typedef
* Using New operator
* Class pointer
* this pointer
* Comparison of new over malloc, calloc and realloc, etc.
* Memory freeing using Delete operator

## Lab:

* Assignments using pointers, arrays of pointers
* Assignments on passing pointers in functions
* Using pointers, write your own functions for the following:
  + String comparison
  + String concatenate
  + String copy
  + String length

*Note:* Do not include <string.h> in your program and implement Delete operator in your program.

## Session 7: OOP Concepts Lecture

* Discussion on object oriented concepts
* Classes and Objects, Access Specifiers, Overloading, Inheritance, Polymorphism
* Constructors and Destructors
* Namespaces

## Lab:

* Write a student class and use it in your program. Store the data of 10 students and display the sorted data according to their roll numbers, dates of birth, and total marks.

## Session 8: Constructor and Destructor Lecture

* Constructors
* Parameterized constructors
* Multiple constructors in class
* Dynamic initialization of objects
* Copy Constructors
* Destructors

## Lab:

* Implement constructor and destructors through your program
* Write a program to implement inner class in C++

## Session 9: Inheritance – extending class Lecture

* Types of inheritance
* Single inheritance
* Multiple inheritance
* Multilevel inheritance
* Hierarchical inheritance
* Hybrid inheritance, etc.
* Virtual base class
* Constructors in derived class

## Lab:

* Design a hierarchy of computer printers. Use multiple inheritance in your hierarchy. Also use friend functions and classes in your program.

## Session 10: Polymorphism Lecture

* Types of Polymorphism
* Overloading functions
* Overloading Operators
* Friend functions
* Constant functions

## Lab:

* Write Date and Time classes that allow you to add, subtract, read and print simple dates in dd/mm/yyyy and time in hh:mm:ss formats. Use function overloading in your program.
* Assignments to overload =, ==, +, ++, --, <<, >> and [ ]operators.

## Session 11: Virtual Functions and Abstract Class Lecture

* Run Time Polymorphism
* Virtual Functions and Pure virtual functions
* dynamic\_cast, static\_cast,const\_cast, reinterpret\_cast
* Interfaces
* Abstract class

## Lab:

* Implement Abstract classes in your program
* Using virtual and pure virtual functions implement hierarchy of computer printers
* Implement diamond problem with real life example

## Session 12: Exception Handling Lecture

* Exception Handling Introduction
* Exception handling – throwing, catching, re-throwing an exception
* Specifying exceptions etc.

## Lab:

* Implement exceptions and do proper management through your program
* Implement Custom exception class

## Session 13: Managing Console I/O Operations Lecture

* Introduction
* C++ streams
* C++ stream classes
* Unformatted I/O operations
* Formatted I/O operations
* Managing output with manipulators

## Lab:

* Implement console I/O operations through your program.

## Session 14: File Handling in C++ Lecture

* Definition of file
* File handling in C++
* Doing read, write operation in files

## Lab:

* Assignments on files doing different operations

## Session 15: Templates Lecture

* Introduction to Templates
* Function Templates
* Class Templates

## Lab:

* Assignments on templates

## Session 16: STL and RTTI Lecture

* Introduction to C++ Standard Library
* Introduction to RTTI (Run-Time Type Information) in C++

## Lab:

* Assignments on STL Library